

## APPARATUS AND METHOD TO ALLOCATE COMMUNICATION RESOURCES IN A COMMUNICATION SYSTEM

### CROSS-REFERENCE TO A RELATED PATENT APPLICATION

[0001] This patent application is a continuation patent application of copending U.S. patent application Ser. No. 13/575,742, filed Sep. 5, 2012, was originally filed as PCT Application No. PCT/FI2010/050086 filed Feb. 11, 2010, from which priority was claimed by applicant, the disclosures of which are all incorporated by reference herein in their entireties.

### TECHNICAL FIELD

[0002] The present invention is directed, in general, to communication systems and, in particular, to an apparatus, system and method to employ interference cancellation and communication resource reservation limits to allocate communication resources in a communication system.

### BACKGROUND

[0003] Long Term Evolution (“LTE”) of the Third Generation Partnership Project (“3GPP”), also referred to as 3 GPP LTE, refers to research and development involving the 3 GPP Release 8 and beyond, which is the name generally used to describe an ongoing effort across the industry aimed at identifying technologies and capabilities that can improve systems such as the

[0004] Universal Mobile Telecommunication System (“UMTS”). The goals of this broadly based project include improving communication efficiency, lowering costs, improving services, making use of new spectrum opportunities, and achieving better integration with other open standards. The 3 GPP LTE project is not itself a standard-generating effort, but will result in new recommendations for standards for the UMTS. Further developments in these areas are also referred to as Long Term Evolution-Advanced (“LTE-A”).

[0005] The evolved UMTS terrestrial radio access network (“E-UTRAN”) in 3GPP includes base stations providing user plane (including packet data convergence protocol/radio link control/medium access control/physical (“PDCP/RLC/MAC/PHY”) sublayers) and control plane (including radio resource control (“RRC”) sublayer) protocol terminations towards wireless communication devices. A wireless communication device or terminal is generally known as user equipment (“UE”) or a mobile station (“MS”). A base station is an entity of a communication network often referred to as a Node B or an NB. Particularly in the E-UTRAN, an “evolved” base station is referred to as an eNodeB or an eNB. For details about the overall architecture of the E-UTRAN, see 3 GPP Technical Specification (“TS”) 36.300, v8.5.0 (2008-05), which is incorporated herein by reference. The terms base station, NB, eNB and cell generally refer to equipment or a location that provides a wireless-network interface in a cellular communication system, and will be used interchangeably herein, and include communication systems such as cellular communication systems other than those designed under 3 GPP standards.

[0006] The future wireless communication systems are expected to serve a large number of access points or nodes, such as low-power base stations, each serving a small number

of wireless communication devices, and each providing high bit-rate, local-area coverage in a relatively small cell or location. Due to high density of communication system deployment, such as in high-density urban areas and in heavily attended public facilities such as sports stadiums, conventional network planning is impractical. Instead, nodes are expected to autonomously interact to share communication resources and thereby manage interference among user equipment using a flexible spectrum use (“FSU”) protocol. The aforementioned practices are intended to provide “optimized local-area” coverage as a supplement to a communication system such as an LTE-based communication system. [0007] Interference cancellation (“IC”) is a process employed in a receiver (e.g., a wireless communication device) that can significantly improve overall reception performance in a communication system. When the resulting level of interference at a receiver is high such as in heavily attended public facilities, interference cancellation allows the receiver to decode an interfering signal and subtract the same from a received signal, thereby enabling reliable communication in communication channels of the communication system that may use overlapping assigned frequencies and time slots.

[0008] In view of the growing utilization of wireless communication devices and the importance of providing communication services to a large number thereof in a small serving area, it is important to provide such capability in a communication system with little impact to architecture thereof and with a reasonable capital investment. Therefore, what is needed in the art is an apparatus, system and method to share communication resources in a communication system without incurring substantial cost or performance degradation to the communication system including the wireless communication devices employed therein.

### SUMMARY OF THE INVENTION

[0009] These and other problems are generally solved or circumvented, and technical advantages are generally achieved, by embodiments of the present invention, which include an apparatus, system and method for providing interference cancellation and communication resource reservation limits to allocate communication resources in a communication system. In one embodiment, the apparatus includes a processor and memory including computer program code. The memory and the computer program code are configured, with the processor, to cause the apparatus to identify an interval of received signal power levels for interference cancellation of an interfering signal to a primary signal, and generate a message that provides the interval of received signal power levels for the interference cancellation of the interfering signal to the primary signal. In a related embodiment, the memory and the computer program code are configured, with the processor, to cause the apparatus to determine a communication resource reservation limit, and request an increase in the communication resource reservation limit.

[0010] The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter, which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other